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EPAct Program Update for Chet France

Module A – Status and Budget

January 23, 2008

Preliminary information – not for release outside EPA

→ roll in JPEC presentation budget #'s here

pads & rotors \$440
cat filter \$170

store
X249

Status of Testing

- Phase 1 testing complete
 - 75F testing of 19 vehicles on 3 fuels (E0, E10, E15)
 - Data was received by EPA, briefing materials were presented on primary findings
- Interim FTP-cycle testing complete
 - 75F testing of 6 vehicles on 3 fuels (E0, E10, E15)
 - Data was received by EPA, this briefing contains primary findings
- Phase 2 testing underway
 - 50F testing of 19 vehicles on 3 fuels (E0, E10, E15)
 - Fuel 17 and 18 testing were recently completed
 - Fuel 19 testing has begun, to be completed by 2/6
 - Data is being processed at SWRI and here
- Phase 3 testing expected to begin mid-February

Fuel Blending Is On-Schedule

- Test fuel development being done cooperatively by Haltermann and ASD
 - EPA defines fuel recipes
 - Haltermann prepares hand blends, bulk blends and performs fuel analyses
- 16 of the 28 fuels needed in Phase 3 have been or are being blended in bulk
 - 8 have been delivered to SWRI
 - E85 fuel will be obtained from CRC
- The remaining 12 fuels are in hand blend stage
- We expect to have all fuels blended in bulk by mid-February
- This will allow randomization of fuels for Phase 3, as planned

Revised EPA Act Fuel Matrix

Fuel #	T50	T90	ETOH	RVP	ARO
	°F	°F	%	psi	%
1	150	300	10	10	15
2	240	340	0	10	15
3	220	300	10	7	15
4	220	340	10	10	15
5	240	300	0	7	40
6	190	340	10	7	15
7	190	300	0	7	15
8	220	300	0	10	15
9	190	340	0	10	40
10	220	340	10	7	40
11	190	300	10	10	40
12	150	340	10	10	40
13	220	340	0	7	40
14	190	340	0	7	15
15	190	300	0	10	40
16	220	300	10	7	40
17	215	325	0	9	30
18	202	325	10	9	25
19	195	325	15	9	23
20	160	300	20	7	15
21	160	300	20	7	40
22	160	300	20	10	15
23	160	340	20	7	15
24	160	340	20	10	15
25	160	340	20	10	40
26	150	340	15	10	40
27	190	340	15	7	15
28	190	300	15	7	40
29	TBD	TBD	85	TBD	TBD
30	150	325	10	10	40
31	160	325	20	10	15

Phase 3
Base Program (EPA)
(Fuels 1-16) →

Phases 1 and 2
RFS 2 Subset (EPA/DOE)
(Fuels 17-19) →

Phase 3
Additional Fuels (DOE)
(Fuels 20-29) →

E85 (DOE) →
CRC Additional Fuels →

→
→
Revised Fuels

Budget Considerations Going Forward

- Original program cost estimate: \$4,271,000
- Cost overrun wrt the original scope of program: **EX. 4 - CBI**
- Cost overrun including additional projects: **EX. 4 - CBI**
- ASD staff have worked hard with SwRI to reduce costs while still keeping the program intact

Program or Project	Cost	Cumulative Cost	Difference of Total From the Original Estimate of \$4,271,000	
EPAct Program, April 2008 Cost Estimate	\$ 4,271,000	-	-	-
EPAct Program, January 2009 Cost Estimate	\$ 4,698,100	EX. 4 - CBI		
Fuel Cost Adjustment				
FTP Testing (Partially Completed)				
EFM Resolution (Completed)				
Fuel Matrix Redesign (Completed)				
Blending of Two CRC Fuels				
Emission Testing of Two CRC Fuels				
ADDITIONAL PROJECTS				

EX. 4 - CBI

* How much SD CAN BE INGS
 * How much CAN FIND
 * How much CAN WE TRIM FROM

Budget Considerations Going Forward (Cont'd)

- Phase 3 cost estimate: \$1,860,000
- Current shortfall: **Ex. 4 - CBI**
- Funds spent or obligated as of Jan. 23, 2009: **Ex. 4 - CBI**
- Phase 3 (Starts in Feb. 2009): **Ex. 4 - CBI**
- Blending and testing of CRC fuels: \$301,000

Program or Project	Date Estimated	Cost		Cumulative Cost	Difference of Total From the Original Estimate of \$4,271,000		Comments
		Estimated	Actual				
Whole EPAct Program	29-Apr-08 6-Jan-09	\$ 4,271,000 \$ 4,698,100	-	-	-	-	Ex. 4 - CBI
Phase 1 (Completed)							
Phase 2 (Compl. Feb 2009)	Jul-08 7-Jan-09						Ex. 4 - CBI
Phase 3 (Starts Feb 09)	7-Jan-09						
Fuel Cost	8-Dec-08						
Fuel Cost Adjustment	21-Jan-09						
FTP Testing (Partially Completed)	7-Jan-09						
EFM Resolution (Completed)	7-Jul-08						
Fuel Matrix Redesign (Completed)	1-Jul-08						
Blending of Two CRC Fuels	7-Jan-09						
Emission Testing of Two CRC Fuels	7-Jan-09						
EX. 4 - CBI							
ORIGINAL PROGRAM							
ADDITIONAL PROJECTS							
Grand Total >>> \$5,413,500 \$1,142,500 26.8%							
Fuel cost adjustment related to reblending of one fuel, some stranded fuel development work by Haltermann and EPA involvement in test fuel development Additional test program to compare LA-92 and FTP tests wrt ethanol impacts Additional program to enable the use of the Sensors exhaust flowmeter in the EPAct Program Statistical redesign of the fuel matrix Exchange with CRC Exchange with CRC							

Projected Schedule Going Forward

- Launch of Phase 3 testing: Mid-February 2009
- Completion of Phase 3 testing: Early December 2009
- Reporting: December 2009 – mid-March 2010

	JAN 2009	FEB 2009	MAR 2009	APR 2009	MAY 2009	JUN 2009	JUL 2009	AUG 2009	SEP 2009	OCT 2009	NOV 2009	DEC 2009
Phase 1 ^a 50F setup Phase 2 ^b 50F teardown	5 12 19 26	2 9 16 23	2 9 16 23 30	6 13 20 27	4 11 18 25	1 8 15 22 29	6 13 20 27	3 10 17 24 31	7 14 21 28	5 12 19 26	2 9 16 23 30	7 14 21 28
Phase 3 ^a NREL fuels ^a CRC fuels NREL high emitter draft final report EPANREL review final report	4 5 6 7 8 9		1 2 3 4 5 6 7	8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26			1 2 3 4 5 6 7			8 9 10 11 12 13 14 15 16 17		1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

	JAN 2010	FEB 2010	MAR 2010	APR 2010	MAY 2010	JUN 2010	JUL 2010	AUG 2010	SEP 2010	OCT 2010	NOV 2010	DEC 2010
Phase 1 ^a 50F setup Phase 2 ^b 50F teardown	5 12 19 26	2 9 16 23	2 9 16 23 30	6 13 20 27	4 11 18 25	1 8 15 22 29	6 13 20 27	3 10 17 24 31	7 14 21 28	5 12 19 26	2 9 16 23 30	7 14 21 28
Phase 3 ^a NREL fuels ^a CRC fuels NREL high emitter draft final report EPANREL review final report	4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31		1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31									

Summary of Next Steps

- Complete analysis of FTP cycle effect
 - E15 data is still pending
- Complete Phase 2 testing
 - Analyze and present results for E10 and E15 fuels
- Complete fuel blending and delivery to SwRI
- Perform Phase 3 testing

Additional Slides

Light Duty Exhaust Program Summary

- EPA/DOE collaboration
- Objective: Establish effects of RVP, T50, T90, aromatic content and EtOH on exhaust emissions from Tier 2 vehicles
- Fuel matrix includes 29 fuels + 2 added by CRC = total of 31
- Test Program Design
 - Phase 1: RFS 2 Pilot at 75°F
 - 3 fuels (E0, E10 and E15) tested in 19 vehicles
 - Test results to be available for RFS 2 NPRM
 - Phase 2: RFS 2 Pilot at 50°F
 - Same as Phase 1, except temperature
 - Phase 3: Main Program
 - 27 fuels tested in 19 Tier 2 vehicles, E85 tested in 4 FFVs
- LA92 test cycle used throughout the program
- Species measured: Regulated emissions, CO₂, NO₂, VOCs, ethanol, carbonyl compounds
 - N₂O, NH₃ and HCN by FTIR
 - Some PM and SVOC speciation

Test Fuel Properties

PROPERTY	UNIT	METHOD	FUEL		
			E0	E10	E15
Ethanol Content	vol. %	D5599	<0.1	9.35	14.5
T50	°F	D86	215	209	182
T90	°F	D86	324	319	310
RVP	psi	D5191	9.17	9.05	8.91
Aromatics	vol. %	D1319	29.3	22.9	18.7
Olefins	vol. %	D1319	6.4	5.7	5.6
Benzene	vol. %	D3606	0.48	0.49	0.46
S	mg/kg	D5453	23	23	21
RON	-	D2699	93.4	93.7	93.9
MON	-	D2700	83.5	84.9	84.6
(R + M)/2	-	Calc.	88.5	89.3	89.2

Measured Species

- Bag (phase) level and composite emissions of THC, NMHC, NMOG, CO, CO₂, NO_x, NO₂, ethanol and PM
- Bag (phase) level speciated volatile organic compounds (VOCs)
 - Over 200 compounds, incl. alcohols and carbonyls
- Continuous and integrated by bag (phase) emissions of the following species in raw exhaust:
 - THC, NMHC, CO, CO₂, NO_x
 - N₂O, NH₃ and HCN by FTIR for a subset of tests
- Semi-volatile and high molecular weight VOC and PM measured in Phases 1 and 2 only